



Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Ventilator Management
Title:	Standard of Practice: Care of the Mechanically Ventilated Patient
Policy #:	01
Revised:	03/00

1.0 DESCRIPTION

1.1 Definition: Mechanical ventilatory support may be provided to a patient through a wide variety of mechanical, pneumatic, electronic, and microprocessor-driven devices for the purposes of life support during acute respiratory failure, therapeutic support of suboptimal cardiopulmonary function, or therapeutic support of chronic ventilatory failure. Ideally, mechanical ventilatory support should:

- Maintain alveolar ventilation to ensure adequate elimination of carbon dioxide.
- Maintain arterial oxygenation to ensure adequate delivery of oxygen to the tissues.
- Minimize the risk of adverse pressure and volume effects on the lungs (eg, baro-/volutrauma) and cardiovascular system.
- Aim for patient comfort.
- Provide appropriate reconditioning workloads as well as muscle rest during recovery.
- Specific instruction for the use of any of the devices of ventilatory support should be obtained from the Operator's Manuals for the devices. Additionally, specific indications and procedures exist for some devices (see the corresponding procedures in References), and Section policies still apply. The purpose of this Standard of Practice is to provide a *guideline* for proper care of the patient whose medical management includes the use of any of the devices of mechanical ventilatory support.

1.1 Indications

1.1.1 Hypercapnic respiratory failure resulting from:

- 1.1.1.1 Decreased respiratory drive
- 1.1.1.2 Increased dead space
- 1.1.1.3 Right-to-left shunt
- 1.1.1.4 Mechanical failure
- 1.1.1.5 Hypermetabolism with resulting increases in carbon dioxide production

1.1.2 Hypoxic respiratory failure resulting from:

- 1.1.2.1 Right-to-left shunt
- 1.1.2.2 Ventilation-perfusion mismatch

1.1.2.3 Diffusion defect

1.1.2.4 The acute respiratory distress syndrome (ARDS)

1.1.3 Refer to the operator's manual and/or procedure for device-specific indications (see References).

1.2 Contraindications:

1.2.1 Documented refusal to be mechanically ventilated as per an advance directive signed by the patient or an acceptable surrogate

1.2.2 Device-specific contraindications may exist. Refer to the operator's manual and/or procedure

1.3 Potential Complications

1.3.1 Pulmonary barotrauma

1.3.2 Ventilator-associated pneumonia

1.3.3 Cardiovascular compromise

1.3.4 Increased intracranial pressure

1.3.5 Device-specific complications may exist. Refer to the operator's manual and/or procedure.

1.4 Precautions

1.4.1 Mechanical ventilatory devices are highly sophisticated requiring understanding of the technical components of their design, the pathophysiology of the respiratory system, and the patient-ventilator interaction. Personnel who are primarily responsible for implementing mechanical ventilation or associated changes to the parameters of mechanical ventilation must demonstrate competence in:

1.4.1.1 The technical setup and operation of the device

1.4.1.2 Cardiopulmonary physiology and pathophysiology

1.4.1.3 Interpretation of the results of arterial blood gas analysis

1.4.1.4 Assessment of the need for mechanical ventilatory support, therapeutic response, and adverse reactions

1.4.1.5 The ability to respond appropriately to adverse reactions as well as to make recommendations to improve the ventilator plan of care

1.4.1.6 Appropriate application of universal precautions

- 1.4.2 Mechanical ventilatory devices should not be adapted for uses other than those intended by the manufacturer.
- 1.4.3 Any device which fails to perform according to the manufacturer's specifications should not be used for patient care. Refer all equipment failures and malfunctions to appropriate service personnel.

1.5 Adverse Reactions and Interventions

- 1.5.1 If mechanical ventilation results in life-threatening cardiopulmonary compromise, or the mechanically ventilated patient exhibits life-threatening physical signs, appropriate life support measures must be implemented. Specifically, the caregiver must:
 - 1.5.1.1 Ensure that the patient has an adequate airway.
 - 1.5.1.2 Ensure that ventilation is supported via the use of a manual resuscitator.
 - 1.5.1.3 Ensure that oxygenation is optimized.
 - 1.5.1.4 Ensure that steps are taken to preserve cardiac function.
- 1.5.2 If a malfunction of the device is suspected, remove the patient from the device and ensure appropriate oxygenation and ventilation. Do not reinstitute mechanical ventilation with the device until troubleshooting maneuvers prove proper function. Secure an alternate ventilatory device when necessary.
- 1.5.3 Device-specific interventions may exist. Refer to the operator's manual and/or procedure.

2.0 EQUIPMENT AND SUPPLIES

- 2.1 Manual resuscitator and appropriate size mask
- 2.2 Cardiopulmonary monitor and supplies
- 2.3 Pulse oximeter and supplies
- 2.4 Suction equipment and supplies
- 2.5 Intubation equipment and supplies
- 2.6 Stethoscope
- 2.7 Oxygen analyzer

2.8 Pressure monitor

2.9 Volume monitor

2.10 Timepiece

2.11 Device-specific humidification system

2.12 Device-specific patient interface and circuit including a water trap system capable of closed disposal of condensation (when necessary) **NOTE: Pediatric circuit shall be utilized on pts. weighing < 20kg.**

2.13 Test lung

2.14 Continuous Ventilation Record

2.15 Universal precautions attire

2.16 Calibration equipment and preventive maintenance documentation as per the manufacturer's specifications and departmental policy

3.0 PROCEDURE

3.1 Assure device readiness for use through evidence of calibration/performance verification.

3.2 Assess appropriateness of physician's orders and set ventilatory parameters accordingly. Initial settings as well as changes to ventilatory parameters must be accompanied by physician's orders.

3.3 Ensure proper device function with a test lung.

3.4 Connect the patient to the device. Assess the patient for tolerance and the patient-ventilator system for good coordination and proper function. Set all applicable alarms including alarms for thermal regulation of the humidification system.

3.5 Perform a thorough assessment of the patient-ventilator system according to the CCTRCS Patient Assessment Policy. Document ventilator data (see 5.0. Documentation) as well as cardiopulmonary data according to CCTRCS policy on the Continuous Ventilation Record. Perform repeat patient-ventilator checks as per policy.

3.6 Monitor the patient continuously via cardiopulmonary monitor and pulse oximetry. Perform arterial pH and blood gas analysis and/or capnometry or transcutaneous monitoring as necessary and per physician order.

- 3.7 Make recommendations for changes to the ventilatory care plan as appropriate.
- 3.8 Perform suctioning and other airway care interventions as clinically indicated to ensure optimal pulmonary management of the patient.
- 3.9 Perform routine circuit and related equipment changes as per Section policy and whenever required to restore integrity of the circuit or when the circuit is visually soiled.
- 3.10 Ensure that ventilator readiness data are filed according to Section policy.

4.0 POST PROCEDURE

- 4.1 Refer to the operator's manual and/or procedure for specific cleaning instructions.
- 4.2 After appropriate disinfection and reassembly, perform a pre-use functional check according to Section policies.

5.0 DOCUMENTATION

- 5.1 A proper record of ventilator care should include documentation of at least the following every two hours:
 - 5.1.1 Ventilator settings comply with physician orders
 - 5.1.2 The ventilator is functioning properly as evidenced by a check of measured volumes, rates, pressures, and FiO₂
 - 5.1.3 Alarms are appropriately set
 - 5.1.4 Measured inspired gas temperature
 - 5.1.5 Transcutaneous oxygen saturation (SpO₂), carbon dioxide, or end-tidal carbon dioxide values (when available)
 - 5.1.6 The signature or initials of the person performing the patient-ventilator system check and the person's credentials are documented at the time of the check.
- 5.2 A proper record of ventilator care should include documentation of the following, at least every twelve hours:
 - 5.2.1 Alarms are activated and respond appropriately
 - 5.2.2 The patient's artificial airway is secure and positioned as previously documented

- 5.2.3 A manual resuscitator and appropriate size mask are available at the bedside and functional
 - 5.2.4 Physician's orders for ventilator parameters as written are up-to-date
 - 5.2.5 Physical assessment results are documented (see the CCTRCS Patient Assessment Policy).
- 5.3 A proper record of ventilator care should include documentation of the following as needed:
- 5.3.1 Ventilator circuitry and/or manual resuscitation equipment is changed according to policy or as needed when visibly soiled or leaky
 - 5.3.2 Changes to the ventilatory parameters are documented at the time of change, and circled for easy identification
 - 5.3.3 Airway care maneuvers (including suctioning) are documented when performed
 - 5.3.4 Transport parameters, adverse events, weaning parameters, care plan information, etc. are documented as needed to ensure the most complete information on the patient and a good continuity of care.
- 5.4 This documentation shall be made on the patient's Continuous Ventilation Record and/or the nursing flowsheet.
- 5.5 See the CCTRCS Patient Assessment Policy for specific information on the communication and reporting of pertinent patient information to the oncoming shift.

6.0 REFERENCES

- 6.1 CCTRCS Policy "Patient Assessment, Documentation and Communication of Patient Care Information"
- 6.2 CCTRCS Policy "General Standards for Mechanically Ventilated Patients"
- 6.3 AARC Clinical Practice Guideline "Patient-Ventilator System Checks"
- 6.4 AARC Clinical Practice Guideline "Humidification during Mechanical Ventilation"
- 6.5 AARC Clinical Practice Guideline "Ventilator Circuit Changes"

- 6.6 AARC Clinical Practice Guideline “Transport of the Mechanically Ventilated Patient”
- 6.7 Servo Ventilator 900C - Operating Manual
- 6.8 Servo Ventilator 300 - Operating Manual
- 6.9 BiPAP® Ventilatory Support System Clinical Manual
- 6.10 CCTRCS Procedure “Use of the Respironics BiPAP® Ventilatory Support System”
- 6.11 Ambu TransCARE Series Ventilators Operator’s Manual
- 6.12 CCTRCS “TransCARE I Transport Ventilator Procedure”
- 6.13 CCTRCS “Equipment Change Policy”
- 6.14 CCTRCS “Ventilator Weaning Procedure”
- 6.15 CCTRCS “Receiving and Implementing of Physician Orders Policy”
- 6.16 CCTRCS “Infant, Pediatric and Adult Ventilator Circuit Size Guidelines Policy”
- 6.17 CCTRCS “Servo Calibration Policy”
- 6.18 CCMD “Pressure Control Setting Policy”
- 6.19 CCMD “Pressure Support Mode Ventilation Policy”
- 6.20 CCMD “Ventilator Settings Change Policy”
- 6.21 CCTRCS “Compliance Measurements Policy”
- 6.22 CCMD “Physician Section Patient Transport Policy”

SIGNATURE: _____
Assistant Section Chief, CCTRCS, CCMD

DATE: _____

SIGNATURE: _____
Section Chief, CCTRCS, CCMD

DATE: _____

SIGNATURE: _____
Medical Director, CCTRCS, CCMD

DATE: _____

(Orig. 8/97)
(Rev. 3/00)